CLAIMS

1. A plasma sputter reactor, comprising:

a vacuum chamber arranged about a central axis and configured to be sealed to a sputter target and comprising a surface material to be sputtered;

a pedestal when in a processing position for supporting a substrate to be processed in opposition to said target across a processing space extending along said central axis between said target and said pedestal;

an RF coil arranged around said central axis; and

an annular magnetic ring producing a DC magnetic field inside of said RF coil at least partially along said array disposed radially outside of RF coil and being at least partially axially coextensive therewith.

2. The reactor of Claim 1, wherein said annular magnetic ring has an axial length along said central axis at least as long as that of said coil.

3. The reactor of Claim 2, wherein said annular magnetic ring extends axially closer to said substrate than does said coil

4. The reactor of Claim 3, wherein said coil extends axially closer to said target than does said magnetic ring.

5. The reactor of Claim 1, wherein said annular magnetic ring comprises an annular array of permanent magnets magnetized along said central axis.

6. The reactor of Claim 1, wherein said annular magnetic ring comprises an electromagnetic coil encircling said central axis.

7. The reactor of Claim 1, wherein said magnetic coil is a single-turn band-shaped coil.

8. The reactor of Claim 1, wherein said target comprises tantalum.

9. A plasma sputter and processing reactor, comprising:

a vacuum chamber arranged about a central axis and configured to be sealed to a sputter target and comprising a surface material to be sputtered;

a pedestal when in a processing position for supporting a substrate to be processed in opposition to said target across a processing space extending along said central axis between said target and said pedestal;

a single-turn coil arranged around said central axis in a lower half of said processing space and having a tubular shape with an aspect ratio of axial length to tube thickness of at least four; and

an annular magnet ring radially outside of said chamber and being at least partially axially coextensive with said coil.

10. The reactor of Claim 9, wherein said magnet ring extends from a plane perpendicular to said central axis and passing through said coil to a plane perpendicular to said central axis between said coil and said pedestal.

11. The reactor of Claim 9, further comprising:

a selective RF power supply passing RF current between opposite ends of said coil; and

a selective DC power supply biasing said coil to a selected voltage.

12. The reactor of Claim 9, further comprising a magnetron positioned on a side of said target and comprising an inner pole of a first magnetic polarity along said central axis and an outer pole surrounding said inner pole and having a second magnetic polarity opposite said first magnetic polarity, wherein said annular magnet ring comprises a plurality of magnets having said first magnetic polarity.

13. A shield adapted for use in a plasma sputter reactor and generally circularly symmetric about an axis, comprising:

an upper end extending along said axis;

a lower end extending along said axis; and

a flange extending radially outward from said axis between said upper and lower ends;

wherein an inner surface shield facing said axis slopes no more than 10° from said axis and is otherwise smooth.

14. The shield of Claim 13, wherein a upper terminus of said upper end is shaped to form a plasma dark space between a target and an isolator of said plasma sputter reactor.

15. The shield of Claim 13, wherein a lower part of said lower end has an annular recess formed on an outer surface of said lower end to reduce a radial thickness of said lower part.

16. The shield of Claim 13, further comprising a plurality of circular recesses formed in a circular array in an outer surface of said lower end.

17. The shield of Claim 13, wherein said recesses are configured to accommodate portions of an electrical standoff passing though said lower end in an area of said recesses.

18. The shield of Claim 13, further comprising two flat faces adjacent to each other for accommodating respective plates and having respective holes formed therethrough for passing respective electrical lines.

19. The shield of Claim 18, further comprising two cutouts in an outer side of said flange adjacent to said two flat faces.

20. For use in a sputter reactor comprising (a) a vacuum chamber arranged about a central axis, (b) a target including a support flange supporting said target on said chamber and a recess formed between said flange and a sputtering region of said target, and (c) a pedestal having an operational position along said central axis for supporting a substrate in

opposition to said target,

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a shield generally circularly symmetric about said central axis, comprising:

an upper end extending along said axis into said recess;

a lower end extending along said axis to in back of a top surface of said pedestal in said operation position; and

a flange extending radially outward from said axis between said upper and lower ends;

wherein an inner surface shield facing said axis slopes no more than 10° from said central axis and is otherwise smooth.

21. The shield of Claim 20, wherein a upper terminus of said upper end is shaped to form a plasma dark space between said target and an isolator disposed between said target and metallic sidewalls of said chamber.

22. The shield of Claim 20, wherein a lower part of said lower end has an annular recess formed on an outer surface of said lower end to reduce a radial thickness of said lower part.

23. The shield of Claim 20, further comprising a plurality of circular recesses formed in a circular array in an outer surface of said lower end.